Organizational Resilience and Sustainability, A Strategic Match Made in Heaven.

Madalena Sales Maldonado

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Author: Madalena Sales Maldonado

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Abstract:

How does an eighty-year-old plastics manufacturer sustain its relevance in an ever-evolving market? Transitioning from a dictatorship to a democracy, and from a world dominated by plastics to one increasingly advocating against it, how has Baquelite Liz managed to survive and thrive? This study aims to analyze Baquelite Liz's strategic evolution over time, shedding light on the approaches that have enabled the company to navigate unexpected and dynamic market conditions. Additionally, the case explores how striking a balance between innovation and perseverance contributes to fostering organizational resilience.

Secondarily, this study further challenges the negative perception, albeit common, that consumers hold regarding plastics, thereby clarifying and reinforcing their relevance in our daily lives.

Finally, teaching notes are provided, offering guidelines to assist in analyzing the case and clarifying its theoretical relevance.

Autor: Madalena Sales Maldonado

Título: Resiliência Organizacional e Sustentabilidade, O Par Estratégico Perfeito.

Palavras-Chave: Plástico, Resiliência Organizacional, Sustentabilidade, Competências Centrais e Limitações Centrais, Gestão de Produto, Estratégia.

Resumo:

Como é que um fabricante de plásticos com oitenta anos de existência consegue manter a sua relevância num mercado em constante evolução? Transitando de uma ditadura para uma democracia, e de um mundo dominado pelo plástico para um cada vez mais crítico em relação ao seu uso, como tem a Baquelite Liz conseguido sobreviver e prosperar? Este estudo propõe-se a analisar a evolução estratégica da Baquelite Liz ao longo do tempo, destacando as abordagens que permitiram à empresa enfrentar condições de mercado inesperadas e dinâmicas. Adicionalmente, o caso explora como o equilíbrio entre inovação e perseverança contribui para o fortalecimento da resiliência organizacional.

Secundariamente, este estudo ainda desafia a perceção negativa dos consumidores, porém comum relativamente aos plásticos, deste modo esclarecendo e relembrando a sua pertinência no nosso dia-a-dia.

Por fim, são disponibilizadas notas pedagógicas que oferecem diretrizes para auxiliar na análise do caso e clarificar a sua relevância teórica.

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Theoretical Background

Dynamic Capabilities

The Resource-Based View (RBV) is a strategic management theory aiming to explain how firms achieve competitive advantage and sustain it overtime while assuming "that firms can be conceptualized as bundles of resources, that those resources are heterogeneously distributed across firms, and that resource differences persist over time"[1]. Under the previous assumptions, the VRIN framework encompasses the implications for competitive advantage to be sustainable. According to such idea, a firm's resources must be valuable, rare, inimitable, and non-substitutable[2]. The RBV is considered static since it does not explain how competitive advantage is sustained through unpredictable and fast-paced shifts in competitive environments.

Teece, Pisano and Shuen (1997) attempted to "explain how some firms and not others achieve and sustain a competitive advantage", filling in the gap existent in theory[3]. In their paper *Dynamic Capabilities*, the concept of dynamic capabilities is developed as "the firms' ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments"[4]. The theory was built around six main elements namely "nature, role, context, creation and development, outcome, and heterogeneity"[5]. *Nature* refers to what dynamic capabilities fundamentally are: abilities, capacities, processes, and routines that organizations resort to in order to respond to changing environments. *Role* is the function of dynamic capabilities in an organization,

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[1] Eisenhardt, K. M, & Martin, J. A. (2000). Dynamic Capabilities: what are they?. *Strategic Management Journal*, 21, 1105-1121, https://doi.org/10.1002/1097-0266(200010/11)21:10/11%3C1105::AID-SMJ133%3E3.0.CO;2-E

[2] Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17 (1), 99-120. https://doi.org/10.1177/014920639101700108

[3] Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management*, 36(1), 256-280. https://doi.org/10.1177/0149206309350776

[4] Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18(7), 509-533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z

[5] Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management*, 36(1), 256-280. https://doi.org/10.1177/0149206309350776

and these were seen as mechanisms for shifting resources and capabilities. More recent viewpoints have broadened this role to encompass decision-making abilities as well as the ability to recognize and take advantage of opportunities in the market. *Context* refers to the environments in which dynamic capabilities are relevant. Initially, dynamic capabilities were thought out as a solution for sustaining competitive advantage in rapidly changing environments. However, later studies suggest its applicability for moderately changing environments. Identifying the contexts that are most pertinent to the study of dynamic capabilities is the challenge. "Dynamic capabilities are typically built rather than bought" meaning they are created and evolve through organizational processes rather than acquired externally, as referred in the definition of *Creation and Development*. *Outcome* is about the effects dynamic capabilities have on organizational performance. *Heterogeneity* deals with how different firms' dynamic capabilities are from one another. While some scholars contend that each organizations' dynamic capabilities are distinct and influenced by their own history and setting, others contend that there are commonalities that can be seen among many businesses. Reconciling various points of view and comprehending how uniqueness and commonality can coexist are the challenges[6].

This basis allows the dynamic capabilities theory to be consistent with "RBV in a particular type of context while still retaining its purpose"[7]. Subsequently, alternatives were offered in the following years as dynamic capabilities became a "hot topic".

In 2007, Teece publishes a most clarifying paper, *Explaining Dynamic Capabilities: the nature and microfoundations of (sustainable) enterprise performance*. A new description of dynamic capability is delivered as "the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets"[8]. Altogether, the

[6] Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management*, 36(1), 256-280. https://doi.org/10.1177/0149206309350776

[7] Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management*, 36(1), 256-280. https://doi.org/10.1177/0149206309350776

[8] Teece, D. J. (2007). Explicating Dynamic Capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28, 1319-1350. https://doi.org/10.1002/smj.640

ability to perfectly execute all three of the above provides a firm basis for successful innovation and long-lasting elevated financial performance[9].

Core Capabilities and Core Rigidities

Core capabilities are crucial for a firm's success and can be defined as the knowledge and skills that distinguish a firm strategy and puts it ahead of its competitors. However, projects aimed at developing new products and processes are clear, visible examples of where the demand for innovation and the preservation of critical skills collide. Managers dealing with core capabilities encounter a paradox whereby they both drive and impede progress.

The opposite of core capabilities are core rigidities, which stand for the policies, procedures, and ideals that, while once crucial to a business's success, are now impediments to its ability to innovate and adapt. When a company's strategic defining competences become ingrained and unyielding to change, core rigidities arise. A company's ability to adapt to innovative technologies, procedures, or market needs may be hampered by these rigidities.

During periods of crisis or environmental change, firm's core rigidities are exposed. Technological discontinuities, changes in market demand, and changes in competitive dynamics serve as triggers to highlight how antiquated beliefs and rigid systems can impede creativity and adaptability[10] .

[9] Teece, D. J. (2007). Explicating Dynamic Capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28, 1319-1350. https://doi.org/10.1002/smj.640

[10] Leonard-Barton, D. (1992). Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal*, 13, 111-125, https://www.jstor.org/stable/2486355

Strategies in Response to Crisis

In Bansal, Kim and Wood (2018), the authors define crisis as issues, "events, developments, and trends that have organizational consequences", and latent issues, "events, developments, and trends that have potential organizational consequences"[11].

After a thorough analysis of different firms' responses to crisis, Wenzel, Stanske and Lieberman (2020) aggregates the latter into four main strategies for responding to crisis[12].

The first strategy enunciated is *Retrenchment* which refers to "cost-cutting measures that potentially reduce the scope of a firms' business activities"[13]. This strategy is viable in the short-run and often times inevitable. However, when facing a long-lasting crisis, "continued retrenchment may lead to an erosion of a firm's valuable resources, capabilities, and culture"[14]. *Persevering* is a strategy that encompasses "keeping everything as it is". Maintaining business strategy and number of resources employed the same through debt financing and consuming slack resources. *Innovating* is renewing the firm's strategy. Reymen, Andries, Berends, Mauer, Stephan, and van Burg's (2015) shows "how firms start to explore new alternatives, expand their activities toward other sectors, and reflect on new ways of doing business in the wake of environmental uncertainties"[15]. In a long-lasting crisis, it might be detrimental to resort to innovating for

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[11] Bansal, P., Kim, A., & Wood, M. O. (2018). Hidden in Plain Sight: The Importance of Scale in Organizations' Attention to Issues. *Academy of Management Review*, 43(2), 217-241. https://doi.org/10.5465/amr.2014.0238

[12] Wenzel, M., Stanske, S., & Lieberman, M. B. (2020). Strategic Responses to Crisis. *Strategic Management Journal*, 41, V7-V18. https://doi.org/10.1002/smj.3161

[13] Wenzel, M., Stanske, S., & Lieberman, M. B. (2020). Strategic Responses to Crisis. *Strategic Management Journal*, 41, V7-V18. https://doi.org/10.1002/smj.3161

[14] Wenzel, M., Stanske, S., & Lieberman, M. B. (2020). Strategic Responses to Crisis. *Strategic Management Journal*, 41, V7-V18. https://doi.org/10.1002/smj.3161

[15] Wenzel, M., Stanske, S., & Lieberman, M. B. (2020). Strategic Responses to Crisis. *Strategic Management Journal*, 41, V7-V18. https://doi.org/10.1002/smj.3161

a firm to survive as it leads to the exploration of alternative sources of revenue[16]. *Exit* is the fourth strategy presented. Despite the appearance, this strategy is not a "last-resort" nor does it mean filling for bankruptcy. *Exit* entails the discontinuation of a firm's activities which may lead to freeing-up firm's resources to be employed in a new setting that exploits opportunities such crisis created[17].

Technological innovation is the pillar of progress. An organization can only face and overcome an obstacle such as a shift in the market through innovation. However, technological innovation can only equalize progress when it is effectively employed in a new business model. Organizations must develop and adapt their business models in a way that captures the value of the innovation. After all, it is the application of technological innovations through business that will affect society[18].

Organizational Resilience

Organizational Resilience comes from child and individual psychology, from the study of one's ability to withstand and recover from a traumatic event. Through the strategic management lens, organizational resilience helps organizations react more effectively to unfavorable circumstances and bounce back from unexpected downturns faster[19].

Some firms are better than others at navigating a crisis and bouncing back after them. The pre-shock features of a firm can impact how effectively it withstands and

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[16] Wenzel, M., Stanske, S., & Lieberman, M. B. (2020). Strategic Responses to Crisis. *Strategic Management Journal*, 41, V7-V18. https://doi.org/10.1002/smj.3161

[17] Wenzel, M., Stanske, S., & Lieberman, M. B. (2020). Strategic Responses to Crisis. *Strategic Management Journal*, 41, V7-V18. https://doi.org/10.1002/smj.3161

[18] Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Elsevier Ltd,* 43(2-3), 172-194. https://doi.org/10.1016/j.lrp.2009.07.003

[19] Van der Vegt, G. S., Essens, P., Wahlstrom, M., & George, G. (2015). Managing Risk and Resilience. *Academy of Management Journal*, 58(4), 971-980. https://doi.org/10.5465/amj.2015.4004

bounces back from such shocks. Scholars have identified a set of pre-shock features that help endure crisis[20].

DesJardine et al., argue the role of social and environmental business practices in contributing to organizational resilience, and measure stability and flexibility of organizations after the global financial crisis[21].

Corporate governance structure and CEO's characteristics are studied as determining pre-shock features. Banks led by narcissistic CEO's tend to be more risk-taking. Activities involving higher risk tend to decrease corporate resilience long-term making it harder for organizations to bounce back from crisis. However, in the presence of outside directors, when boards are strongly overseen, CEO's do not tend to take such riskier decisions, hereby acting more resiliently[22].

Innovation has been researched as a pre-shock feature fostering organizational resilience. Intensive R&D, valuable patents, product introductions, and management's innovation-oriented values enhance stability and flexibility during crisis. Thus, innovation gives businesses the flexible tools needed to react swiftly to shifting circumstances, hastening recovery. A culture of agility is fostered by a top management's focus on innovation, which makes businesses more resilient overall by enabling them to pivot successfully during shocks[23].

[20] Engelen, A., Huesker, C., Rieger, V., & Berg, V. (2024). Building a resilient organization through a pre-shock strategic emphasis on innovation. *Journal of Product Innovation Management*, 4, 36-61, https://doi.org/10.1111/jpim.12697

[21] DesJardine, M., Bansal, P., & Yang, Y. (2019). Bouncing Back: Building Resilience Through Social and Environmental Practices in the Context of the 2008 Global Financial Crisis. *Journal of Management*, 45 (4), 1434-1460. https://journals.sagepub.com/doi/pdf/10.1177/0149206317708854

[22] Buyl, T., Boone, C., & Wade, J. (2019). CEO Nascissism, Risk-Taking, and Resilience: An Empirical Analysis in U.S. Commercial Banks. *Journal of Management*, 45(4), 1372-1400.

[23] Engelen, A., Huesker, C., Rieger, V., & Berg, V. (2024). Building a resilient organization through a pre-shock strategic emphasis on innovation. *Journal of Product Innovation Management*, 4, 36-61, https://doi.org/10.1111/jpim.12697

Methodology

Methodology Overview

This dissertation employs a qualitative research method to explore "Business Adaptive Strategies in Crisis", focusing on the plastics industry, more specifically, Baquelite Liz S.A.

Baquelite Liz S.A., a plastic manufacturer in Leiria, Portugal since 1946, has faced many shifts in the industrial, political, and economic landscapes to which it had to adapt to. The goal of this dissertation is to provide theoretical background on strategic response to crisis, insights of the Portuguese plastics industry, and develop further into the practical case of Baquelite Liz, S.A. Lastly, this dissertation offers teaching notes to enable the case study's application to a wide range of Management classes.

Data was acquired through qualitative research in the form of interviews and study of journalistic articles. João Rezola Clemente and Jaime Rezola Clemente, Directors of Baquelite Liz, S.A., offer insights on the history of the plastics industry in Portugal, challenges faced by firms overtime, and different responses to the latter. João Rezola Clemente accompanied me in a guided tour of the factory, where I got to watch and learn about every detail of the production process. During my visit to the injection and extrusion areas, I was provided with an in-depth explanation of how both production processes operate. Additionally, I was informed about several noteworthy accounts regarding the challenges faced by Baquelite Liz due to fluctuating demand for products from both processes. These stories highlighted the difficulties encountered by the company during such periods and illustrated the strategies implemented to endure and recover from those challenges. Furthermore, I gained insights into the significance of automation and the enhancement of equipment, as I was informed about the notable increases in productivity that resulted from specific investments in these areas.

The Future of Plastics

Deloitte's report "The Plastics Transition" together with Plastic Europe develops a pathway for plastics to be "circular", have a net-zero life cycle and to foster a sustainable use of plastics. Marco Ten Bruggencate, President of Plastics Europe, confronted with the strategically importance of plastics for the European Economy, the lack of more sustainable alternatives and its application in a wide range of sectors, states "It was necessary for us to formulate a vision for a truly sustainable plastics system that continues to meet consumer and societal demands"[24].

The Portuguese plastics industry aligns and intents to walk along The Plastics Transition pathway. *Pólo de Inovação em Engenharia de Polímeros* (PIEP), a college facility at *Universidade do Minho*, designed to "convert ideas into smart sustainable products", sends off freshly graduated engineers to the job market, who have learned the more innovative methods for plastics manufacturing. In an interview for the article *História da Indústria na Região de Leira, Plásticos*, Rui Magalhães, former general-director of PIEP, mentions partnerships between PIEP and multinational corporations such as Shell and Repsol focused on development projects. Large-sized firms seek PIEP's expertise considering PIEP "has been responsible for the development of ecological/green materials and for them being validated in demanding sectors such as the automobile industry". For the same article, the administrator of Tecfil, Paulo Valinha, shines light on the future of plastics. Valinha affirms that plastics will remain in the life of everyone with great impact, "while humanity exists, so do plastics". However, to understand the latter, Valinha warns to keep two aspects in mind. First, "the plastics of today are not the plastics of tomorrow". This statement underlines the importance of innovation and investment to fund it. Second of all, the urgency to "cut the umbilical cord with the black gold". In order to create and produce plastics that do not depend on fossil

[24] Debrabander, F. (2023). The Plastics Transition. *Deloitte*. https://www.deloitte.com/be/en/issues/working-together-towards-a-sustainable-future/the-plastics-transition.html

fuels, huge efforts must be made with universities and other sectors such as metal, wood and cork to develop hybrid biodegradable plastics[25].

Changing Society's View on Plastics

Maria Elvira Callapez, a researcher at the *Centro Interuniversitário de História das Ciências e da Tecnologia*, concentrates her academic work on the study of plastics and their historical development. In the following, I will endeavor to convey the insights and knowledge I have gained through her research.

Disseminating accurate scientific information is essential for society to move beyond the populist misconception that plastics are inherently problematic materials. Even individuals who use the term "plastic" as an adjective to imply something fake, superficial, or lacking in values and substance undoubtedly rely on plastics in their everyday lives. Plastics are not only versatile, cost-effective, lightweight, and resilient materials; they are also exceptionally durable, resistant to corrosion, and serve as excellent thermal and electrical isolators. These intrinsic qualities enable plastics to play a vital role in addressing societal challenges, as they possess the unique ability to be molded and adapted to various solutions. Plastics have made positive and innovative contributions across a variety of fields. In medicine, they offer potential for the design of synthetic human tissues and play a significant role in organ transplant procedures. In the field of transportation, plastics enable the production of remarkably lightweight vehicles, including advanced aircraft such as the Boeing 787. Furthermore, their isolating properties have proven valuable in the construction industry, contributing to energy efficiency and structural durability.

The negative perception society holds toward plastics due to their synthetic nature is, in fact, debatable. While it's true that plastics are artificial materials created by humans, this does not inherently make them harmful. Many naturally occurring substances, such as mercury, lead, and others, are actually hazardous to humans. This

[25] Nazário, J. & Barata, A. (2015). História da Indústria na região de Leira Plásticos. *Jornal de Leiria*. https://pt.slideshare.net/slideshow/historia-da-industriaplastico/239926493

demonstrates that simply being a synthetic material does not automatically mean that plastics are detrimental, just as natural origins do not guarantee a material's safety for human use. Examining the history of plastics can provide valuable insight into their origins and purpose. Plastics were initially developed as an alternative to ivory, a material considered highly "natural" but whose extensive use has contributed significantly to the endangerment and, in some cases, the extinction of large mammals, such as the Black Rhino.

Similar to other materials, plastics can be managed in a more responsible and appropriate manner. A comprehensive understanding of plastics will contribute to fostering more sustainable practices and driving innovative developments in the field. The concern surrounding the potential harm of plastics to the environment and human health is frequently misattributed to the nature of the material itself. In reality, however, this harm stems from society's problematic habits regarding the consumption, use, and disposal of plastics. It is these unsustainable practices, rather than the material's inherent properties, that drive the environmental and health issues associated with plastics. Consequently, these behaviors could potentially lead to similar issues with any alternative material that may replace plastics in the future. Addressing issues such as unregulated plastic waste and expanding landfills, as well as counteracting the pervasive use of single-use plastics, can be achieved through robust recycling efforts. Recycling not only reduces the environmental impact of plastic waste but also provides significant opportunities to lessen reliance on petroleum resources and decrease carbon dioxide emissions. In addition, to mitigate the environmental hazards posed by chemical spills from plastics and the persistent presence of plastic debris, coordinated actions between government and industry aimed at enforcing stricter regulatory controls could prove to be an effective solution[26,27].

[26] Callapez, M. E. (2019). Um olhar sobre as histórias dos plásticos. *SIC Notícias*. https://sicnoticias.pt/arquivo/plastico-nosso-de-cada-dia/2019-06-20-Um-olhar-sobre-as-historias-dos-plasticos

[27] Callapez, M. E. (2020). (Des) demonizar os plásticos. *Faculdade de Ciências da Universidade de Lisboa*. https://ciencias.ulisboa.pt/pt/noticia/13-01-2020/des-demonizar-os-plásticos

The Case of Secil – Microalgae Colonies' Growth on Acrylic Tubes

Alongside the Secil factory in Alcobaça, Cibra-Pataias, there are long acrylic tubes that captivate the curiosity of passersby, leaving them intrigued. These tubes contain 300 kilometers of microalgae colonies, which grow at an astonishing rate, with their biomass doubling at least twice a day. This remarkable growth is a result of the microalgae's daily consumption of part of the CO2 emissions produced by the factory's operations. According to Gonçalo Salazar Leite, administrator of Secil, tells Público, that this is the "largest set of photobioreactors in a close system in the world" and the result of a 15 million euro investment.

The project, initiated in 2008, emerged from a growing concern regarding environmental sustainability, particularly due to the significant pollution associated with the production of cement powder. This initiative primarily aims to promote sustainability, while simultaneously offering a secondary business opportunity, as these microalgae are commercially viable, presenting itself as an excellent example of a circular economy[28] (see Appendix A).

[28] Coelho, A. P. (2016). O que leva uma cimenteira a produzir microalgas? *Público*. https://www.publico.pt/2016/10/27/ciencia/noticia/o-que-leva-uma-cimenteira-a-produzir-microalgas-1748934

Case Study

Baquelite Liz

In the 1940s, tailor Francisco Clemente's home was a hub for evening gatherings where gentlemen tailored suits, exchanged ideas, and listened to the radio. These lively discussions often covered various topics, and one fateful night, the conversation turned to plastics. Inspired by this discussion, Clemente, along with business partners Luís Gonçalves and Joaquim Abraúl, founded Baquelite Liz in 1946. Despite the restrictive Estado Novo regime, which stifled freedom and innovation, the company managed to grow and prosper through persistence (see Appendix B).

Baquelite Liz's early success stemmed from its ability to adapt and innovate. Initially, the factory focused on bakelite products, but bakelite's rigidity and inability to be reshaped after hardening presented challenges. To overcome these limitations, Baquelite Liz introduced new processes such as injection molding – a groundbreaking process for shaping plastics. Injection molding involves heating plastic granules until they melt, injecting the molten material into a mold under high pressure, and cooling it rapidly to create precise, repeatable parts. Although mold manufacturing is costly, requiring precision and specialized skill, the process became a key driver of the company's success due to its efficiency and scalability.

In 1957, the company expanded into extrusion, a process ideal for high-volume production of pipes and tubes. This innovation allowed Baquelite Liz to secure a significant contract with *Companhia dos Telefones* to replace traditional solid brick telephone conduits with PVC pipes. Extrusion involves melting plastic within a machine and shaping it through a die. The material is then cooled and cut to specific dimensions, ensuring uniformity and durability in the final product (see Appendix C and D).

By 1967, Baquelite Liz further diversified its offerings by manufacturing high-density polyethylene boxes and bottle crates, which remain essential to its output. A major milestone came in 1997 when the factory expanded to cover 40,000 square meters. This growth enabled the installation of two polyethylene production lines equipped with automated rolling systems, the first of their kind in the Iberian Peninsula. Automation

significantly boosted productivity, reduced delivery times, and established Baquelite Liz as an anonymous society by 1998.

The company continued to innovate in the following decades. Between 2006 and 2008, it earned conformity certificates for PE80 and PE100 polyethylene pipes for water distribution, demonstrating its commitment to quality. In 2010, the company upgraded its storage management with a "picking" system to streamline operations. Subsequent advancements included new PVC extrusion lines, injection molding equipment, and enhanced engraving processes in 2017 and 2019, further increasing production capacity.

In 2021, Baquelite Liz installed photovoltaic panels, reflecting its dedication to sustainability. These strategic investments and innovations over the decades have secured Baquelite Liz's reputation as a resilient, forward-thinking leader in the plastics industry (see Appendix C).

Managerial Strengths

In its early years of existence, Baquelite Liz focused its production on personal goods and household appliances. In the sixty's, Jaime Clemente, chemical engineer with specialization in plastics from England, managed the production and specialized it in plastics for industrial purposes (i.e., Boxes and bottle crates) and towards construction material (i.e., Water pipes).

The current production line at Baquelite Liz is notably diversified, which the management considers a significant strength of the company. The operational simplicity of a plastics manufacturing facility is remarkable, as a single injection molding machine has the capability to produce an extensive range of products. By simply altering the mold within the machine, it becomes possible to create a virtually limitless array of items, underscoring the versatility and adaptability inherent in this manufacturing process. The flexibility inherent to injection molding machines allows Baquelite Liz to not only present a wide variety of products but to easily innovate and diversify offerings. However, it is often challenging to determine which products should continue to be offered and which should be discontinued.

Discontinuing the production of a product requires substantial courage, particularly given the dynamic nature of the market, where a product may appear to become obsolete, only for demand to rise unexpectedly and without reliable anticipation.

For instance, Baquelite Liz ceased the production of baby bathtubs for several years. However, recently, a man unexpectedly approached the company with a proposal to introduce these bathtubs at Continente, a major retail outlet. He occasionally places "unconventional" orders, adding an unexpected dynamic to their renewed business relationship, tells João Rezola Clemente, director of Baquelite Liz. Other discontinued products are unlikely to be reintroduced into production, as their manufacturing processes were tailored to the standards and conditions of the 1950s, rather than those of the present day. In that timeframe, Baquelite Liz offered children's toys which were entirely hand-painted, a process for which there is now neither the workforce available nor the infrastructure suited to meet contemporary production demands. Additionally, these products did not adhere to current regulatory standards for toys, including specific requirements related to size and safety. In light of the above, certain products cannot be reintroduced in the present market due to their incompatibility with current standards and lack of suitability. Conversely, other products remain relevant and align well with contemporary demand and regulatory frameworks.

In guiding their production process, Baquelite Liz follows a principle whereby any product that has not been manufactured for an entire year is removed from regular stock. From that point forward, such a product is only produced upon receiving a sufficiently large order. When this occurs, Baquelite Liz manufactures a quantity that exceeds the immediate order requirements, thus reintroducing the product into stock and making it available for sale once more. Baquelite Liz only ceases production of a product permanently if the mold required for its manufacturing is either damaged beyond repair or if repair costs are prohibitively high, making further production economically unviable. Generally, however, the company does not fully discontinue products; instead, they control whether the products remain in stock based on demand and production feasibility. Moreover, the storage of molds and unsold loose products does not incur substantial costs, as rooms, previously designated for activities no longer conducted (such as painting toys and boxes), have been repurposed for use as storage spaces.

Another relevant production case that serves to illustrate the preceding discussion is the case of bottle crates. Throughout the 1980s and the first half of the 1990s, bottle

crates accounted for 50% of BL's total sales. However, the rise and proliferation of large retail outlets, which were increasingly accessible to a broad base of consumers, significantly impacted this market. Additionally, the pressure on glass manufacturers and tare packaging producers contributed to a decline in the demand for returnable packaging solutions. These combined factors gradually undermined the market for returnable packaging, reducing the viability and profitability of bottle crates. In 2000, Portugal's Minister of the Environment, José Sócrates, launched an initiative to enforce mandatory returnability, prompting bottling companies to invest in specialized filling lines for returnable containers. However, when Sócrates ascended to the position of Prime Minister, the initiative was abandoned, causing the efforts and investments made by bottlers to be rendered futile. João Reloza Clemente mentions how at the time, a client contracted Baquelite Liz to manufacture twenty thousand bottle crates. This order remained in the factory for ten years, as the client was unable to find a market to utilize the crates. The director recalls a specific conversation with the client in which the client emphasized the profitability of the returnable business model and highlighted its sustainability. He noted that glass bottles, a key component of this model, could remain in circulation for up to five years, significantly reducing waste and environmental impact. However, he also pointed out a shift in consumer behavior, indicating that customers had largely ceased to purchase products packaged in this manner. Overall, the other manufacturers that were primarily or exclusively engaged in the production of bottle crates exited the market, leaving Baquelite Liz as the sole remaining competitor in the Portuguese market. This crisis persisted for two decades, with the company enduring an equivalent period without the production of bottle crates. Given the broad range of Baquelite Liz's product offerings, they were able to identify alternative avenues for production. The machines and technology that had once been dedicated to manufacturing bottle crates were repurposed to produce boxes for various goods, including fish, meat, fruit, and other items. At present, in response to the pressure exerted by Europe on its member states to reduce waste and actively contribute to a circular economy, the reintroduction of bottle crates is becoming increasingly prevalent. This is largely driven by the fact that glass, in particular, remains one of the materials furthest from achieving the recycling targets set by the European Union.

Automation

In 1995, Baquelite Liz employed two hundred and twenty individuals. However, the management identified a significant advantage in the impending retirement of a large segment of its workforce. The factory maintains continuous operations, running twenty-four hours a day, five days a week, which requires the implementation of three shifts per day for each task. In the injection section, Baquelite Liz invested in advanced robotic technology, allowing a shift from having one operator per machine to one operator managing two machines, as the new robots are equipped with enhanced automation capabilities. This investment enabled Baquelite Liz to operate with a reduced workforce, effectively halving personnel requirements while maintaining productivity levels, thereby achieving cost reductions without any compromise in operational efficiency. In the extrusion department, investments were directed toward enhancing production line efficiency. Prior to 1998, a single tubing line produced 3,000 meters per day. However, with the acquisition of a new machine that year, production capacity was significantly increased to over 3,000 meters per hour. In the hoses department, the three existing production lines altogether initially produced 3,000 meters. Following investment in advanced technology, the hose production capacity rose to 20,000 meters. These strategic investments enabled the company to accommodate the gradual retirement of personnel without the need to hire additional staff, thereby sustaining operations with the existing workforce.

An improvement João Rezola Clemente underlines as “particularly difficult for the staff to adapt to” was the use of forklifts. For years, collaborators were used to stack the product on the floor and move it one by one by hand from one place to another. It took a surprising amount of time for the staff to move the product onto pallets effectively. Appendix D is composed by two pictures that depict the factory’s panorama before the use of forklifts and pallets and demonstrate the amount of labor needed to move product.

Sustainability

Fostering Circularity in Production

In a world grappling plastic waste, challenging the “take-make-waste” approach is inevitable. Until 2024, approximately 36% of all plastics produced were for packaging, single use packages for food and beverage containers, around 85% of which is disposed in landfills or as unregulated waste. Manufacturers of durable plastic products bear a significant environmental responsibility to produce high-quality, resilient products. Baquelite Liz exemplifies this commitment, consistently prioritizing product quality and focusing on the development of long-lasting plastic goods. For instance, a glass-bottle rack manufactured in 1981 has been in continuous use and transport between beverage production facilities and various restaurants for a period of forty-three years. It is now returning to Baquelite Liz for appropriate disposal.

Relatively to domestic supplies, the same quality standards are demanded. Laundry supplies, including basins, have been manufactured from plastic for the past century. This preference is attributed to plastic's impermeability, durability, and lightweight characteristics, rendering it the most practical and efficient material for such applications. Baquelite Liz, however, produces a basin that is marginally heavier while maintaining an adequate weight for ease of transport. This design ensures that the product remains sufficiently lightweight for convenient handling while also providing exceptional longevity.

To promote a circular economy, it is essential to prioritize recycling following the reuse phase. Baquelite Liz collects boxes and bottle crates from across the country that are no longer suitable for use and recycles them, regardless of whether they were originally produced on-site or externally. Products once returned go into a granulator and mill which breaks them down into granulates of recycled raw material ready to reenter the value chain. This granulator and mill is responsible for the recycling process of injection made products. However, not all products produced in the factory are made from the same polymer therefore there have to be more mills to be able to recycle pipes and hoses to avoid cross-contamination of different raw materials. Recycling a hose is more challenging than appears since the product has two different materials within. There was an issue with separating the plastic part of a hose and the reinforcement material, which

is a different, more resistant material, and therefore could not be recycled together. Baquelite Liz made in-house a recycling machine for hoses able to separate these different materials inside a hose and gather all the plastic for later use. The latter serves as an example of the firm's efforts towards sustainability and innovation.

Once it is time for the recycled plastic to be reintegrated, it is mixed with virgin raw material to produce a more sustainable new product without sacrificing its quality. Unfortunately, some products are still not allowed to be developed from recycled material. Plastic containers procured by food retailers, such as Continente, cannot be manufactured from recycled plastic due to the inability to ascertain the substances the plastic has previously come into contact with. This uncertainty raises concerns regarding potential health hazards associated with direct contact between the plastic and food products.

Recycling, in addition to repurposing products that are no longer viable, enables plastic manufacturers to reduce their reliance on virgin raw materials, which are partially derived from a byproduct of petroleum. The latter not only enhances sustainability but also promotes economic freedom, as the cost of raw materials fluctuates in tandem with oil prices.

Fostering Circularity for Clients

Furthermore, Baquelite provides sustainable solutions for customized client requests, demonstrating adaptability and innovation in its manufacturing processes. Clients frequently engage the company for specialized production needs. Recently, a Spanish retail transportation company approached Baquelite Liz seeking a plastics manufacturer capable of producing a pre-designed product. The client required transport boxes for food items that could sustain a stable internal temperature for extended periods. Baquelite Liz addressed this requirement by developing a set of advanced transport boxes capable of maintaining the internal temperature of goods for up to eleven hours. These boxes represent a significant improvement in sustainability by reducing the need for thermal trucks, which are notably less environmentally friendly. Another notable example of a product offered by Baquelite Liz, designed to enhance the sustainability of its clients' businesses, is the acrylic tubing. These transparent tubes are specifically crafted to

support the development of microalgae colonies, which carry out photosynthesis by capturing carbon dioxide (CO_2) emissions released by factories. In addition to providing substantial environmental benefits by reducing atmospheric CO_2, the microalgae produced can be commercialized, offering clients an additional stream of revenue. This dual advantage – environmental impact mitigation alongside economic opportunity—demonstrates Baquelite Liz's commitment to sustainable innovation. A notable instance of employing microalgae colonies to achieve sustainable objectives is exemplified by Secil, Cimenteira de Pataias, another Portuguese company from the Leiria region. Secil has invested in an extensive network of acrylic tubes in which microalgae continuously reproduce. Spanning over three hundred kilometers, this represents the largest set of closed system photobioreactors in the world.

De-demonize Plastics

Currently, plastics are widely vilified, often perceived as inherently harmful due to their synthetic nature, environmental impact, and general reputation as detrimental materials. This chapter aims to address and clarify these misunderstandings, challenging the misconception that the negative attributes associated with plastics are intrinsic to the material itself.

The harmful effects, pollution, and subsequent health and environmental hazards that society confronts today stem from habits associated with the consumption, use, and disposal of plastics. It is these practices, rather than the material itself, that contribute to pollution and pose significant risks. This implies that if an alternative material were introduced to replace plastics, it would likely result in the same adverse impacts associated with plastics. This is because the new material would be subject to similar patterns of misuse and mishandling, leading to comparable environmental and societal issues.

In the pursuit of sustainability, an uncritical shift away from plastics may risk undermining the very goals it seeks to achieve. While alternative materials like paper or cloth are often perceived as more environmentally friendly, they carry their own substantial ecological footprints, from deforestation to increased energy and water consumption. True environmental stewardship lies not in demonizing materials but in

maximizing their responsible use. Fostering a culture of reuse and recycling supports the principles of a circular economy, ensuring resources remain in use longer, waste is minimized, and the environmental benefits of each material are optimized. By focusing on effective recycling and conscientious reuse, sustainable practices can be embedded more deeply across communities, consumers and producers, fostering resilience and resourcefulness.

Teaching Notes

Pedagogical Goals

The Baquelite Liz case primarily exemplifies the practical applications of Organizational Resilience theory, as well as the concepts of Core Capabilities and Rigidities. In addition, the case illustrates strategic approaches to crisis analysis and response. This is achieved through the company's sustained capacity for innovation and endurance over time. Baquelite Liz effectively addressed technological advancements and shifts in consumer behavior, which posed both threats and opportunities. The company's adaptive responses to these external changes enabled it not only to maintain its operational stability but also to flourish in a competitive market environment. Furthermore, the emphasis on sustainability not only renders the case highly relevant in the current context but also distinctive, as it approaches sustainability as "built into" plastics manufacturing—a perspective that may initially appear controversial. Overall, the case exemplifies the right balance between innovation and perseverance needed to foster organizational resilience.

This case is therefore a good fit for Management, Business, Strategic Management, and Sustainable Business classes.

Synopses

This case study examines the journey of Baquelite Liz, a Portuguese plastics manufacturing company established in 1946 by Francisco Clemente and his partners, Luís Gonçalves and Joaquim Abraúl. Over the decades, Baquelite Liz expanded its capabilities into processes like extrusion to produce PVC pipes and injection molding producing offerings, including polyethylene bottle crates and industrial boxes.

Under the leadership of Jaime Clemente in the 1960s, the company shifted its focus from household goods to plastics for industrial and construction purposes, capitalizing on market opportunities. However, the company faced significant challenges, including changing consumer behaviors and policy reversals. Despite this, Baquelite Liz

demonstrated remarkable resilience being capable of sustaining operations during market downturns.

More recently, the company has invested in sustainability initiatives, integrating circular economy practices. Despite the societal vilification of plastics, Baquelite Liz positions itself as a leader in sustainable manufacturing, producing durable, high-quality products and innovating recycling processes for complex materials like hoses. The company's actions reflect a commitment to reducing environmental impact while maintaining profitability in an industry often criticized for its ecological footprint.

By continuously adapting to technological advancements and market demands, Baquelite Liz has navigated decades of political, economic, and environmental challenges. The company's trajectory illustrates the interplay of innovation, resilience, and sustainability in achieving long-term success in a competitive and dynamic industry.

Process of Analysis

The case provides a comprehensive examination of how Baquelite Liz balanced innovation, resilience, and sustainability. It illustrates the company's responses to dynamic challenges, including shifts in consumer behavior, market demands, and environmental pressures, all while maintaining profitability and industry leadership.

The case study aims to achieve several pedagogical objectives. First, it provides an in-depth look at organizational resilience by showcasing how a company can endure and thrive amid economic, and market disruptions through both innovation and adaptability, and perseverance. Second, it highlights sustainability practices, demonstrating how firms in traditionally criticized industries like plastics can adopt circular economy principles to contribute meaningfully to environmental sustainability. Third, the case delves into the complexities of strategic decision-making, exploring the challenges associated with product diversification, discontinuation, and reinvention within a manufacturing context. Fourth, it examines the role of innovation in manufacturing, analyzing how investments in technology, such as automation and advanced recycling systems, can enhance operational efficiency while promoting sustainable practices. Finally, the study encourages discussion around ethical considerations by addressing the role of plastics in modern society, challenging common

misconceptions, and emphasizing the importance of responsible production and consumption.

This case study offers students an opportunity to critically examine the interplay between sustainability and resilience in a real-world organizational context, highlighting the potential for long-term growth through strategic foresight and innovation.

The primary objective of this case study is to illustrate the core managerial strengths that have enabled the company to maintain its relevance in the industry for 80 years. By focusing on these strengths, the case aims to demonstrate how the organization has shown resilience in adapting to the ever-evolving dynamics of the market. Furthermore, the case delves into the company's approach to sustainability, particularly addressing the growing consumer concerns related to plastics. In the context of sustainability, the case seeks not only to highlight the company's proactive measures but also emphasize that the challenges are less about plastics themselves and more about consumer behavior and waste management practices.

The structure of the case is designed to discuss managerial strengths and sustainability efforts as distinct themes. However, the analysis is intended to integrate these two aspects, demonstrating how their interplay contributes to fostering organizational resilience. By examining this intersection, the case provides a comprehensive view of how the company has balanced innovation with perseverance to overcome challenges and sustain its position in the market.

The desired learning outcome for students is to understand the strategic balance required to achieve organizational resilience. Through this case, students will analyze how adopting industrial innovations, such as automation, in conjunction with aligning with consumer trends, such as sustainability, can drive long-term success. The case underscores the importance of achieving an equilibrium between embracing innovation and maintaining steadfastness in established markets. This balance has been a pivotal factor in the company's ability to navigate crises and thrive during challenging periods.

Professors teaching this case are encouraged to guide students in recognizing these interdependencies, fostering discussions that not only dissect the company's historical strategies but also apply these lessons to contemporary business scenarios.

Analysis

Potential questions that highlight the teachings of the case and help guide the analysis are:

Question 1: "*Perseverance and Innovation can be two different strategies in response to crisis. Explain how these two can apply to the case of Baquelite Liz."*

Sample Answer:

Baquelite Liz addresses challenges by demonstrating both perseverance and innovation. In the context of the company's approach to managing its product offerings, their perseverance is evident in their commitment to maintaining the production capability of items with diminished market demand. Rather than discontinuing such products entirely, the company ensures that the molds designated for these items are preserved in an operable condition. These molds are stored and retained for potential use, ensuring readiness to resume production when there is a justifiable need. ("Generally, however, the company does not fully discontinue products; instead, they control whether the products remain in stock based on demand and production feasibility.").

This process also necessitates innovation, as it requires the efficient reallocation of labor and technology when a product is no longer in stock. In such cases, the resources previously dedicated to producing the unavailable product are redirected toward manufacturing a product experiencing higher demand. This approach effectively repurposes slack resources to maximize productivity and responsiveness. To facilitate these dynamic adjustments, the factory's operations are meticulously managed to ensure that these transitions occur both swiftly and seamlessly. ("Given the broad range of Baquelite Liz's product offerings, they were able to identify alternative avenues for production. The machines and technology that had once been dedicated to manufacturing bottle crates were repurposed to produce boxes for various goods, including fish, meat, fruit, and other items.").

Baquelite Liz's capacity to effectively manage and balance perseverance with innovation lies in its ability to discern which previous practices no longer serve a meaningful purpose, as they hinder progress by evolving into core rigidities, and which

practices remain valuable. The capability to differentiate between these two categories of practices and to manage them appropriately enables the company to maintain its position "in the sweet spot" where perseverance and innovation coexist harmoniously.

Additionally, if the class is familiar with Wenzel, M., Stanske, S., & Lieberman, M. B. (2020) Strategic Responses to Crisis, relating the question with the paper is encouraged.

Question 2: *"How does Baquelite Liz uses diversity and product management to endure and bounce back from crisis?"*

Sample Answer:

Baquelite Liz has a product management system based on demand and product feasibility, only discontinuing products indefinitely when the mold is damaged beyond repair. In the case of bottle crates described in the case study, Baquelite Liz demonstrates clearly their endurance and response to crisis. This particular case depicts the decrease in demand of a product that represented 50% of their sales at the time. The strategic decision by their management to refrain from discontinuing the product enabled them, two decades later, when demand resurged, to be the first in line to produce and market it. Their approach of reallocating machinery and labor to the production of other high-demand products when a particular product experiences a downturn in demand ensures that Baquelite Liz continues to generate profits from its already-employed workforce. This practice also mitigates the costs associated with a product that has temporarily experienced a decline in market interest.

Moreover, Baquelite Liz adheres to a strategy of identifying and responding to "demand clues," positioning itself to capitalize on potential future increases in demand. For example, in the case of baby bathtubs, when an unanticipated request for the production of these items was received, the company chose to produce a quantity exceeding the initial order. This approach was aimed at replenishing stock with the product, as the unexpected order was interpreted as a possible indicator of rising demand. Overall, the factory's operational dynamics are structured in a manner that enables the company to anticipate, respond to, and recover effectively from fluctuations in demand.

This adaptability is achieved through the ability to swiftly reallocate both the workforce and production materials from one product to another as required.

Additionally, the company ensures that it does not entirely phase out previously high-demand products, maintaining readiness to resume their production should demand for them rise again.

Question 3: *""Fostering Sustainability demands innovation, from changing routines and well-set practices to investing in new technology. Engaging in sustainability enhancement as a pre-shock feature fosters organizational resilience." Comment and discuss in class."*

Key Points for Discussing:

Address how sustainability drives innovation: demands rethinking traditional methods and well-set practices, fostering creativity and training workforce to adapt to change.

Address how the latter fosters organizational resilience: Having a creative workforce capable of addressing change with innovative solutions significantly aids the company in enduring crises and recovering effectively. This adaptability enables the organization to navigate adverse conditions with greater ease, facilitating smoother adjustments and resilience in challenging circumstances.

How sustainability directly fosters organizational resilience:
Sustainability directly fosters organizational resilience by enabling access to a broader, green-focused audience, building a loyal customer base that values eco-conscious practices. Additionally, by aligning with current sustainability trends, organizations remain relevant and adaptable in the market, positioning themselves to anticipate and withstand future crises effectively. Sustainability, being a key trend among younger audiences, ensures that a company focused on eco-conscious practices remains relevant to future consumers.

Overall the goal of this question is to foster a discussion in class where students reflect on these topics and can individually make this connection sustainability – innovation – organizational resilience.

Question 4 – "*How can the implementation of cost-cutting measures through automation and the enhancement of adaptability in production processes contribute to recovery from a crisis? Discuss this in relation to the dynamic capabilities theory."*

Sample Answer:

Organizational resilience is demonstrated through an organization's capacity to recover and rebound from crises. The resilience of an organization is directly proportional to the speed and effectiveness of its recovery processes. When a company incorporates the ability to recover from crises into its strategic framework, practiced consistently as part of its daily operations, it can be asserted that such practices represent a dynamic capability. This capability enables the organization to effectively respond to and recover from crises.

When Baquelite Liz invested in automation, the company not only cut by half the labor costs as well as it increased productivity, increasing therefore the marginal productivity of labor, making each unit of labor more profitable. These investments in innovation allow the company to minimize everyday costs.

Furthermore, the adaptability embedded within Baquelite Liz's production processes enables the company to transition seamlessly between products. Their product management strategy is designed to facilitate the swift reintroduction or suspension of production activities in response to fluctuations in demand.

The ongoing introduction of advanced technologies, coupled with the continuous innovation of processes, fosters the development of a workforce that is highly adaptable, well-prepared to embrace change, and capable of learning and beginning anew when required.

Baquelite Liz demonstrates a resilient approach, underpinned by effective cost minimization, flexible production processes, and a highly adaptable workforce. These elements collectively contribute to the company's dynamic capability to navigate and respond effectively to unforeseen shocks.

Appendixes

Appendix A – Picture of *Secil* in Pataias, Alcobaça, showcasing the extremely vast microalgae production.
Source: Picture by Fábio Augusto[29]

Appendix B – Baquelite Liz staff during the 1950's.
Source: Baquelite Liz provided by João Rezola Clemente

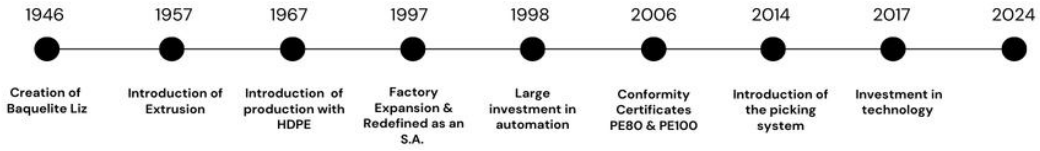
[29] Coelho, A. P. (2016). O que leva uma cimenteira a produzir microalgas? *Público*. https://www.publico.pt/2016/10/27/ciencia/noticia/o-que-leva-uma-cimenteira-a-produzir-microalgas-1748934

Appendix C – Packing and Storing of Extrusion Products.
Source: Baquelite Liz provided by João Rezola Clemente

Appendix D – Baquelite Liz at a Plastics Convention with a sign pledging their commitment to high-end technology and to progress in the Portuguese plastics industry.
Source: Baquelite Liz provided by João Rezola Clemente

Appendix E – Timeline of Baquelite Liz more notorious past events.

Source: Own Figure



Appendix F – Baquelite Liz Before the Use of Forklifts and Pallets

Source: Baquelite Liz provided by João Rezola Clemente

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